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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/716,796	11/20/2003	Raja Singh Tuli		8875

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EXAMINER

DOLAN, JENNIFER M

ART UNIT

PAPER NUMBER

2813

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Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

10/716,796

Applicant(s)

TULI ET AL.

Examiner

Jennifer M. Dolan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 9 is/are allowed.
- 6) ☒ Claim(s) 1-8, 10-27, 35 and 36 is/are rejected.
- 7) ☒ Claim(s) 28-34 and 37-42 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6/9/04</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Objections

1. Claims 9, 17, 18, and 35 are objected to because of the following informalities:

In claim 9, line 1, "such that there is" should be deleted.

In claims 17, 18, and 35, line 5, "a" should be replaced by --at--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 15-18, 35, and 36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claims contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Each of claims 15-18, 35, and 36, require the usage of some alternate material, such as a material adjacent to the anode contact that has slow charge dissipation relative to Alq3 (claims 15 and 16), material adjacent to the anode contact having a trap energy level for longer charge dissipation (claims 17 and 18), or material adjacent to the cathode contact having a trap energy level for longer charge dissipation (claims 35 and 36). No examples of materials having these properties and viable for usage in the claimed OLED were provided. Furthermore, the

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specification does not provide any layer/material structures for the complete display device having these layers. A person having ordinary skill in the art would not know which materials would fulfill these claimed functions and be suitable for use with the other materials in the OLED device, and hence, a person having ordinary skill in the art would not be able to make the claimed invention.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 2 and 13-26 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 2 recites the limitation "the screen" in line 3.

Claim 13 (13-23 and 26) and claim 24 (24, 25) recite the limitation "the N-type light-emitting material" and "the cathode" in lines 1-2.

There is insufficient antecedent basis for this limitation in the claim.

Regarding claim 14, the claim language is further indistinct. The claim recites "The N-type light emitting area adjacent to the anode contact." It is unclear whether the claim intends to refer to the "N-type light emitting material" that is beside the cathode (not the anode), or the N-type (not explicitly light emitting) material that is beside the anode.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1, 3-8, 10-12, and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by the Japanese Journal of Appl. Phys. article to Ni et al. (cited by applicant).

Regarding claims 1, 3, and 4, Ni discloses a monolithic display device (figure 1, pg. 948) with an applied electric field across it (fig. 1), comprising a light emitting material (n-type Alq3) and a light-sensing material (p-type TiOPc layer) such that when the device is illuminated by a laser (pr 948; column 2), photo-current amplification occurs, causing light emission from the light-emitting material (figure 2; page 948, last paragraph – pg 949, first paragraph), where the voltage barrier at the p-n junction is lowered and a voltage imbalance is caused when illuminated by the laser, thereby causing larger amounts of carriers to flow through towards the light-emitting area (page 949; first column).

Regarding claims 5-8, and 27, Ni discloses a light emitting area (Alq3 layer), a light sensing area (TiOPc layer), and a carrier blocking layer (TPD) therebetween (figure 1), where the blocking layer blocks one type of charge carrier (electrons), and the light sensing material is a good conductor of the other type of carrier (holes). Ni further discloses a potential barrier at

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the anode contact with the device (figure 5; page 950; first column), and a potential barrier at the cathode contact with the device (figure 5; page 950), first column).

Regarding claims 10 and 11, Ni discloses that the anode contact is an ITO efficient hole injector (page 950, first column).

Regarding claim 12, Ni discloses that the light-sensing area is made of TiOPc (figures 1 and 5), which is p-type organic semiconductor material (figure 5).

8. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Appl. Phys. Lett. Article (Vol. 57 No. 16) to Hiramoto et al. (cited by applicant).

Hiramoto discloses a monolithic display device (figure 1), with an applied electric field across it (figure 1), comprising a light emitting material (Alq3) and a light sensing material (SiC) such that when the device is illuminated by a laser (page 1626; Ar-ion laser used as input source), photo-current amplification occurs within the device, causing light emission from the light emitting material (page 1626; column 1), where the light addressing is restricted such that as the area of light addressing is transferred across a screen, the area of light emission does so identically to create an image (figure 1).

9. Claims 5-8, 10-12, and 27 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Publication No. 2004/0262614 to Hack et al.

Regarding claims 5-8 and 27, Hack discloses a monolithic display device (figure 1; paragraph 0082), comprising: a light-emitting area (CBP:IR(ppy)3 layer in paragraph 0082); a light sensing area (CuPc/PTCBI structure in paragraph 0082), and a carrier blocking layer (BCP

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layer) between the two, the BCP layer blocking holes flowing toward the sensing region; and the light sensing material being a good conductor of carriers not being blocked (paragraph 0040; light sensing layer is described as having high carrier velocities), where the structure will have some sort of potential barrier at the anode contact (ITO- NPD or ITO-CBP) and at the cathode contact (BCP to Al).

Regarding claims 10 and 11, Hack discloses that the anode contact is an ITO hole injector (paragraph 0082).

Regarding claim 12, Hack discloses that the light-sensing area is made of P-type organic semiconductor (CuPc is a P-type organic semiconductor).

10. Claims 1-4 are rejected under 35 U.S.C. 102(b) as being anticipated by the Appl. Phys. Lett (vol 66, No .22) to Katsume et al. (cited by applicant).

Katsume discloses a monolithic display device (figure 1) with an applied electric field comprising: a light-emitting material (t-BuPh-PTC) and a light sensing material (Me-PTC) such that when the device is illuminated by a laser (figure 1; input light pattern), photo-current amplification occurs in the device, causing emission (figure 3; page 2993, first column), and such that when the addressing light is transferred across a screen, the light emission does so identically to create an image (figure 1). Katsume further teaches that the illumination causes carriers to be formed that lower a voltage barrier at a semiconductor junction or voltage imbalance, causing an amplified amount of carriers to flow towards the light emitting area (page 2992, column 2 – 2993, column 1).

Allowable Subject Matter

11. Claim 9 is allowed.
12. Claims 28-34 and 37-42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
13. The following is a statement of reasons for the indication of allowable subject matter:

The primary reason for allowability is that the claims require a display device structure comprising a stack of a cathode, N-type light emitting material beside the cathode, a carrier blocker layer, a P-type light sensing material, and an N-type material (claim 9); or a stack of a cathode, a P-type light sensing material, a carrier blocking layer, an N-type light emitting material, and another P-type layer (claims 28-34, 37-39, and 42); or a stack of a cathode, a P-type material, a N-type light sensing material; a carrier blocking layer; an N-type light emitting material; and another P-type material (claims 40 and 41).

The prior art of record generally teaches a structure using a single PN junction across the light sensing and light emitting materials, rather than using a PNP or NPN structure, as claimed. For example, the Ni journal article applied supra teaches a layering of an anode, a P-type light sensing material (TiOPc) a carrier blocking layer (TPD; also p-type), and an N-type light emitting material (Alq3), such that only a PN junction is formed. When NPN or PNP structures are used for display devices in the prior art (see, for example, US 2004/0262614 to Hack), they either appear as an NPN or PNP light-sensing element, where an electrode is provided separating the light sensing structure from the light emitting structure. This mechanism is significantly

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different from the claimed invention, however, since the light sensing and light emitting structures are separately driven by separate sets of electrodes, rather than having the light emitting layer and light sensing layer stacked with an electron or hole barrier layer between, such that the light emitting layer is directly driven by carriers generated in the light sensing layer. Furthermore, even if it were possible to combine the teachings of the prior art, the resulting structure would have a stack of an NPN or PNP light sensing element, a charge barrier layer, an electrode, and then an N or P type light emitting layer, which is fundamentally different from the claimed structure.

Since the claimed structure provides advantages over the conventional PN junction structures in improved photo-amplification as well as improved continuous light output, and since the prior art does not provide any teachings or suggestions of using the claimed structures, it is the examiner's opinion that the claimed invention would not have been obvious to a person having ordinary skill in the art.

Conclusion

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- a. U.S. Patent Publication No. 2002/0043927 to Kimura discloses a PN-junction type display device having an integral LED addressing source.
- b. U.S. Patent No. 6,191,764 to Kono et al. and U.S. Patent No. 6,037,718 to Nagami disclose display devices having NPN driving transistors stacked under a light emitting element.

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- c. U.S. Patent Publication No. 2005/0040392 to Wu et al. discloses an OLED display using a PN junction structure and either hole or electron barrier layers.
- d. U.S. Patent Publication No. 2004/0089860 to Edamura et al. discloses a PN junction light-sensing device using hole blocking layers.
- e. U.S. Patent No. 6,692,820 to Forrest et al. discloses motivations for using exciton blocking layers in organic optoelectronic devices.


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan
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Art Unit 2813

jmd


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